

## **2. Long-Range Actuarial Status of the Trust Funds**

Historically, the actuarial balance (described earlier in this section) has been used as the principal measure of the actuarial status of the OASDI program. Actuarial balances have traditionally been computed for the 25-year valuation period encompassing 1994-2018, the 50-year valuation period covering 1994-2043, and the entire long-range (75-year) valuation period, 1994-2068.

Beginning with the 1991 Annual Report, actuarial balances have also been computed based on the intermediate (alternative II) assumptions for valuation periods that are 10 years, 11 years, and continuing through 75 years in length. This series of actuarial balances provides the basis for the test of long-range close actuarial balance, described earlier in this section.

In addition to these actuarial balances, other indicators of the financial condition of the program are shown in this report. One is the series of projected annual balances (that is, the differences between the projected annual income rates and annual cost rates), with particular attention being paid to the level of the annual balances at the end of the long-range period and the time at which the annual balances may change from positive to negative values. Another is the series of projected trust fund ratios, with particular attention being paid to the amount and year of maximum fund ratio accumulation and to the year of exhaustion of the funds. These additional indicators are defined in the introduction to this section.

The estimates are sensitive to changes in the underlying economic and demographic assumptions. The degree of sensitivity, however, varies considerably among the various assumptions. For example, variations in assumed fertility rates have little effect on the estimates for the early years, because almost all of the covered workers and beneficiaries projected for the early years were born prior to the start of the projection period. However, lower fertility rates have large impacts on the actuarial balance in the later years. Variations in economic factors, such as interest rates and increases in wages and prices, have significant effects on the estimates for the short term, as well as for the long term. In general, the degree of confidence that can be placed in the assumptions and estimates is greater for the earlier years than for the later years. Nonetheless, even for the earlier years, the estimates are only an indication of the expected trend

and general range of future program experience. Section II.G contains a more detailed discussion of the effects on the estimates of varying certain economic and demographic assumptions.

Table II.F13 presents a comparison of the estimated annual income rates and cost rates by trust fund and alternative. As previously mentioned, the annual income rate excludes net interest income, as well as certain other transfers from the general fund of the Treasury. Detailed long-range projections of trust fund operations, in nominal dollar amounts, are shown in appendix III.B.

The projections for OASDI under the intermediate alternative II assumptions show income rates that increase slowly and steadily due to the combination of the flat payroll tax rate and the gradually increasing effect of the taxation of benefits. The pattern followed by the cost rates is much different. Costs as a percent of taxable payroll are projected to rise slowly for the next 15 years and then to increase rather rapidly for about the next 20 years (through 2030) as the "baby-boom" generation reaches retirement age. Cost rates continue rising slowly through 2035 and then decline slightly for the next 8 years as the "baby-boom" generation ages and the relatively small birth cohorts of the late 1970s reach retirement age. Thereafter, cost rates rise steadily, but slowly, reflecting projected increases in life expectancy. The cost rates during the third 25-year subperiod rise to a level exceeding 18 percent of taxable payroll under the intermediate alternative II assumptions. The income rate during the third 25-year subperiod is just over 13 percent of taxable payroll under alternative II.

Projected income rates under the low cost and high cost sets of assumptions (alternatives I and III, respectively) are very similar to those projected for alternative II as they are largely a reflection of the tax rates specified in the law. OASDI combined cost rates for alternatives I and III differ significantly in size from those projected for alternative II, but follow generally similar patterns. For the low cost alternative I, cost rates decline somewhat for about the first 15 years, and then rise, reaching the current level around 2017 and a peak of about 13.7 percent of payroll around 2030. Thereafter, cost rates decline gradually, reaching a level of about 12.5 percent of payroll by 2070. For the high cost alternative III, cost rates rise throughout the 75-year period, but at a relatively faster pace during the next 5 years due to the assumed economic recessions, and be-

## Actuarial Analysis

tween 2010 and 2030 because of the aging of the “baby-boom” generation. During the third 25-year subperiod, the projected cost rate reaches 25 percent of payroll and continues rising.

The projected pattern of the OASDI annual balances (that is, the difference between the income rates and the cost rates) is important in the analysis of the financial condition of the program. Under the alternative II assumptions the annual balances are positive for 19 years (through 2012) and are negative thereafter. This annual deficit rises rapidly reaching 2 percent of taxable payroll by 2020 and continues rising thereafter, to a level of 5.67 percent of taxable payroll for 2070.

Under alternative I, projected OASDI actuarial balances are positive for over 25 years (through 2022), are then temporarily negative (through 2041), and thereafter are positive, reaching a level of over 0.5 percent of payroll by 2070. Under the more pessimistic alternative III, however, the OASDI actuarial balance is projected to be positive for only 4 years (through 1997) and to be negative thereafter, reaching deficits of 4 percent of payroll by 2020, 10 percent by 2050, and nearly 15 percent of payroll in 2070.

**TABLE II.F13.—COMPARISON OF ESTIMATED INCOME RATES AND COST RATES BY TRUST FUND AND ALTERNATIVE, CALENDAR YEARS 1994-2070**

[As a percentage of taxable payroll]									
Calendar year	OASI			DI			Combined		
	Income rate	Cost rate	Balance	Income rate	Cost rate	Balance	Income rate	Cost rate	Balance
Intermediate:									
1994....	11.42	10.24	1.18	1.21	1.40	-0.19	12.63	11.64	0.98
1995....	11.39	10.21	1.19	1.21	1.47	-.26	12.60	11.67	.93
1996....	11.42	10.19	1.23	1.21	1.52	-.31	12.63	11.71	.92
1997....	11.42	10.15	1.27	1.21	1.57	-.35	12.63	11.72	.92
1998....	11.42	10.12	1.30	1.21	1.62	-.41	12.64	11.74	.90
1999....	11.42	10.09	1.34	1.21	1.67	-.45	12.64	11.75	.88
2000....	11.20	10.06	1.14	1.43	1.71	-.27	12.64	11.77	.87
2001....	11.21	10.05	1.15	1.43	1.75	-.32	12.64	11.80	.84
2002....	11.21	10.04	1.16	1.44	1.79	-.36	12.64	11.83	.81
2003....	11.21	10.03	1.18	1.44	1.83	-.40	12.64	11.86	.78
2005....	11.23	9.99	1.25	1.44	1.90	-.46	12.67	11.89	.78
2010....	11.31	10.24	1.07	1.44	2.03	-.59	12.75	12.27	.48
2015....	11.40	11.31	.09	1.45	2.10	-.66	12.85	13.42	-.56
2020....	11.50	12.82	-1.31	1.45	2.14	-.69	12.96	14.96	-2.01
2025....	11.60	14.15	-2.55	1.45	2.21	-.76	13.05	16.36	-3.31
2030....	11.67	15.03	-3.36	1.46	2.20	-.74	13.13	17.22	-4.10
2035....	11.71	15.37	-3.66	1.46	2.15	-.69	13.17	17.52	-4.35
2040....	11.73	15.27	-3.54	1.46	2.15	-.69	13.19	17.42	-4.23
2045....	11.74	15.18	-3.44	1.46	2.24	-.78	13.20	17.42	-4.22
2050....	11.77	15.35	-3.58	1.46	2.29	-.83	13.23	17.64	-4.41
2055....	11.80	15.75	-3.95	1.46	2.32	-.86	13.26	18.07	-4.81
2060....	11.83	16.19	-4.35	1.46	2.29	-.83	13.30	18.48	-5.18
2065....	11.86	16.49	-4.64	1.46	2.28	-.81	13.32	18.77	-5.45
2070....	11.87	16.71	-4.84	1.46	2.29	-.83	13.34	19.00	-5.67

**TABLE II.F13.—COMPARISON OF ESTIMATED INCOME RATES AND COST RATES BY TRUST FUND AND ALTERNATIVE, CALENDAR YEARS 1994-2070 (Cont.)**

[As a percentage of taxable payroll]

Calendar year	OASI			DI			Combined		
	Income rate	Cost rate	Balance	Income rate	Cost rate	Balance	Income rate	Cost rate	Balance
<b>Low Cost:</b>									
1994....	11.41	10.13	1.28	1.21	1.36	-0.15	12.62	11.50	1.13
1995....	11.37	9.96	1.41	1.21	1.38	-.17	12.58	11.34	1.24
1996....	11.41	9.79	1.62	1.21	1.39	-.18	12.62	11.18	1.44
1997....	11.41	9.62	1.78	1.21	1.40	-.19	12.62	11.02	1.60
1998....	11.41	9.47	1.94	1.21	1.41	-.20	12.62	10.88	1.74
1999....	11.41	9.33	2.08	1.21	1.42	-.20	12.62	10.75	1.87
2000....	11.19	9.21	1.97	1.43	1.42	.01	12.62	10.64	1.98
2001....	11.18	9.11	2.07	1.43	1.43	(1)	12.62	10.54	2.07
2002....	11.18	9.03	2.16	1.43	1.44	-.01	12.62	10.47	2.15
2003....	11.18	8.94	2.24	1.43	1.46	-.03	12.62	10.40	2.21
2005....	11.20	8.81	2.39	1.43	1.47	-.04	12.64	10.29	2.35
2010....	11.26	8.84	2.42	1.44	1.50	-.06	12.70	10.34	2.36
2015....	11.34	9.67	1.66	1.44	1.51	-.07	12.78	11.18	1.59
2020....	11.41	10.83	.58	1.44	1.49	-.05	12.85	12.33	.53
2025....	11.48	11.75	-.27	1.44	1.50	-.06	12.92	13.26	-.33
2030....	11.53	12.20	-.68	1.44	1.46	-.02	12.97	13.67	-.70
2035....	11.55	12.16	-.61	1.44	1.41	.03	12.99	13.57	-.58
2040....	11.55	11.75	-.20	1.44	1.39	.06	12.99	13.13	-.14
2045....	11.54	11.38	.16	1.45	1.41	.03	12.99	12.79	.20
2050....	11.55	11.21	.33	1.45	1.42	.03	12.99	12.63	.36
2055....	11.56	11.21	.34	1.45	1.41	.03	13.00	12.62	.38
2060....	11.56	11.22	.34	1.45	1.39	.06	13.01	12.61	.40
2065....	11.57	11.16	.40	1.45	1.38	.07	13.01	12.54	.47
2070....	11.57	11.11	.46	1.45	1.38	.07	13.02	12.49	.52
<b>High Cost:</b>									
1994....	11.42	10.30	1.12	1.21	1.44	-.22	12.63	11.73	.89
1995....	11.44	10.56	.87	1.21	1.57	-.36	12.65	12.13	.52
1996....	11.43	10.56	.87	1.21	1.66	-.45	12.64	12.22	.42
1997....	11.43	10.63	.80	1.21	1.75	-.54	12.64	12.38	.27
1998....	11.44	11.11	.34	1.22	1.93	-.71	12.66	13.03	-.37
1999....	11.45	11.19	.26	1.22	2.03	-.82	12.67	13.22	-.56
2000....	11.23	11.18	.05	1.44	2.12	-.68	12.67	13.30	-.63
2001....	11.23	11.21	.02	1.44	2.20	-.77	12.67	13.42	-.75
2002....	11.23	11.28	-.04	1.44	2.29	-.85	12.67	13.56	-.89
2003....	11.24	11.33	-.10	1.44	2.37	-.93	12.68	13.70	-1.02
2005....	11.27	11.32	-.04	1.44	2.45	-1.01	12.72	13.77	-1.05
2010....	11.37	11.57	-.21	1.45	2.58	-1.13	12.82	14.15	-1.34
2015....	11.48	12.72	-1.24	1.46	2.62	-1.17	12.93	15.34	-2.41
2020....	11.59	14.50	-2.90	1.46	2.71	-1.25	13.05	17.20	-4.15
2025....	11.71	16.26	-4.55	1.47	2.83	-1.37	13.18	19.09	-5.91
2030....	11.82	17.74	-5.92	1.47	2.85	-1.38	13.28	20.59	-7.31
2035....	11.90	18.76	-6.86	1.47	2.83	-1.36	13.37	21.59	-8.23
2040....	11.95	19.31	-7.37	1.47	2.89	-1.42	13.42	22.20	-8.78
2045....	12.00	19.88	-7.88	1.48	3.07	-1.60	13.47	22.95	-9.48
2050....	12.06	20.78	-8.72	1.48	3.20	-1.72	13.54	23.98	-10.44
2055....	12.14	22.01	-9.87	1.48	3.29	-1.81	13.62	25.30	-11.68
2060....	12.22	23.34	-11.12	1.48	3.27	-1.79	13.70	26.61	-12.91
2065....	12.29	24.47	-12.18	1.48	3.25	-1.77	13.77	27.72	-13.95
2070....	12.35	25.45	-13.10	1.48	3.28	-1.79	13.83	28.72	-14.89

<sup>1</sup>Negligible, i.e., between -0.005 and 0.005 percent of taxable payroll.

Notes:

1. The income rate excludes interest income and certain transfers from the general fund of the Treasury.
2. Totals do not necessarily equal the sums of rounded components.

## *Actuarial Analysis*

Summarized values for the full 75-year period are useful in analyzing the long-range financial condition of the program under present law and the long-range financial effects of proposed modifications to the law. In order to focus on the full 75-year period as well as on broad patterns through the period, table II.F14 summarizes, on a present-value basis, the projected annual figures presented in the previous table for various periods within the overall 75-year projection period.

Table II.F14 first shows rates on a present-value basis summarized for each of the 25-year subperiods, excluding both the funds on hand at the beginning of the period and the cost of reaching a trust fund target by the end of the period. These rates are useful for comparing the cash flows of tax income and expenditures, as an indicator of the degree to which tax income during the period is sufficient to meet the outgo estimated for the period.

The table also shows summarized rates including the funds on hand at the start of the period and the cost of reaching a target trust fund balance equal to 100 percent of annual expenditures by the end of the period, for valuation periods of the first 25 years, the first 50 years, and the entire 75-year period. Therefore, the actuarial balance for each of these three valuation periods is equal to the difference between the summarized income rate and cost rate for the corresponding period. A balance of zero for any period on this basis would indicate that estimated outgo for the period could be met, on the average, with a remaining trust fund balance at the end of the period equal to 100 percent of the following year's outgo.

The values in table II.F14 show that the combined OASDI program is expected to operate with a positive balance over shorter valuation periods under alternatives I and II. For the first-25-year valuation period the summarizing values indicate balances of 2.03 percent of taxable payroll under alternative I, 0.50 percent under alternative II, and -1.06 percent under alternative III. Thus, the program is more than adequately financed for the next 25-year valuation period under all but the high cost alternative III projections. Over the 50-year valuation period, 1994-2043, the OASDI program would have a positive balance of 1.05 percent under alternative I but would have deficits of 1.29 percent under alternative II and 3.67 percent under alternative III. Thus, the program is more than adequately financed

for the next 50-year valuation period under only the low cost set of assumptions, alternative I.

For the entire 75-year valuation period, the combined OASDI program would again have actuarial deficits except for the low cost set of assumptions, alternative I. The actuarial balance for this long-range valuation period is projected to be 0.90 percent of taxable payroll under alternative I, -2.13 percent under alternative II, and -5.57 percent under alternative III.

**TABLE II.F.14.—COMPARISON OF SUMMARIZED INCOME RATES AND COST RATES BY TRUST FUND AND ALTERNATIVE, CALENDAR YEARS 1994-2068**

[As a percentage of taxable payroll]									
Calendar year period	OASI			DI			Combined		
	Income rate	Cost rate	Balance	Income rate	Cost rate	Balance	Income rate	Cost rate	Balance
<b>Intermediate:</b>									
25-year subperiods: <sup>1</sup>									
1994-2018 . . .	11.32	10.45	0.87	1.38	1.86	-0.48	12.70	12.32	0.39
2019-2043 . . .	11.64	14.60	-2.96	1.45	2.18	-.73	13.10	16.78	-3.69
2044-2068 . . .	11.80	15.85	-4.05	1.46	2.29	-.83	13.26	18.14	-4.88
Valuation periods: <sup>2</sup>									
25-years:									
1994-2018 . . .	11.96	10.91	1.05	1.40	1.94	-.55	13.35	12.85	.50
50-years:									
1994-2043 . . .	11.82	12.49	-.68	1.42	2.04	-.61	13.24	14.53	-1.29
75-years:									
1994-2068 . . .	11.81	13.28	-1.46	1.43	2.09	-.66	13.24	15.37	-2.13
<b>Low Cost:</b>									
25-year subperiods: <sup>1</sup>									
1994-2018 . . .	11.28	9.34	1.94	1.38	1.46	-.09	12.66	10.80	1.86
2019-2043 . . .	11.50	11.78	-.28	1.44	1.46	-.01	12.94	13.24	-.29
2044-2068 . . .	11.55	11.26	.29	1.45	1.40	.04	13.00	12.66	.33
Valuation periods: <sup>2</sup>									
25-years:									
1994-2018 . . .	11.88	9.73	2.15	1.39	1.52	-.13	13.27	11.25	2.03
50-years:									
1994-2043 . . .	11.71	10.60	1.12	1.41	1.48	-.07	13.13	12.08	1.05
75-years:									
1994-2068 . . .	11.67	10.73	.94	1.42	1.46	-.04	13.09	12.19	.90
<b>High Cost:</b>									
25-year subperiods: <sup>1</sup>									
1994-2018 . . .	11.36	11.58	-.22	1.38	2.29	-.91	12.75	13.87	-1.13
2019-2043 . . .	11.79	17.45	-5.65	1.47	2.84	-1.37	13.26	20.29	-7.03
2044-2068 . . .	12.14	22.20	-10.06	1.48	3.23	-1.75	13.62	25.42	-11.80
Valuation periods: <sup>2</sup>									
25-years:									
1994-2018 . . .	12.03	12.10	-.07	1.40	2.39	-.99	13.43	14.49	-1.06
50-years:									
1994-2043 . . .	11.92	14.45	-2.52	1.43	2.58	-1.15	13.35	17.03	-3.67
75-years:									
1994-2068 . . .	11.98	16.27	-4.29	1.44	2.72	-1.28	13.42	18.99	-5.57

<sup>1</sup>Income rates do not include beginning trust fund balances and cost rates do not include the cost of reaching ending fund targets.

<sup>2</sup>Income rates include beginning trust fund balances and cost rates include the cost of reaching an ending fund target equal to 100 percent of annual expenditures by the end of the period.

Note: Totals do not necessarily equal the sums of rounded components.

## *Actuarial Analysis*

Also of interest are the long-range financial conditions of the separate OASI and DI programs. As may be concluded from tables II.F13 and II.F14, the DI program is in very poor financial condition. The DI program has estimated deficits for every period shown under alternatives I, II, and III. The OASI program also has long-range deficits, but they occur later in the long-range period and they are smaller, relative to program costs.

Annual net cash flow under alternative II, as represented by the balances in table II.F13, remains positive for 22 years for the OASI program, but is negative in every year for DI, by increasingly large amounts. The relatively less-adequate financing for DI is evident as well in the estimates based on alternatives I and III.

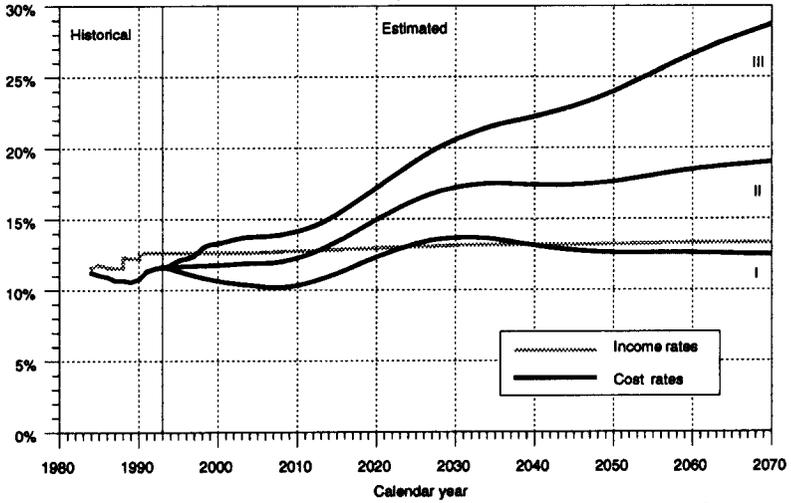
Figure II.F3 shows in graphical form the patterns of the OASDI annual income rates and cost rates. The income rates are shown only for alternative II in order to simplify the graphical presentation and because, as shown in table II.F13, the variation in the income rates by alternative is very small. The OASDI long-range summarized income rates for alternatives I and III, for the 75-year valuation period, differ by only about 0.3 percent of taxable payroll. By 2070, the annual income rates under alternatives I and III differ by only about 0.8 percent of taxable payroll. Only small fluctuations are projected in the income rate, as the rate of income from taxation of benefits varies only slightly, for each alternative, reflecting changes in the cost rate and the fact that benefit-taxation threshold amounts are not indexed.

The patterns of the annual balances are indicated in figure II.F3. For each alternative, the magnitude of each of the positive balances in the early years, as a percent of taxable payroll, is represented by the distance between the appropriate cost-rate curve and the income-rate curve above it. The magnitude of each of the deficits in subsequent years is represented by the distance between the appropriate cost-rate curve and the income-rate curve below it.

In the future, the cost of the OASDI program, as a percent of taxable payroll, will not necessarily be within the range encompassed by alternatives I and III. Nonetheless, because alternatives I and III define a reasonably wide range of economic and demographic con-

ditions, the resulting estimates delineate a reasonable range for future program costs.

FIGURE II.F3.—ESTIMATED OASDI INCOME RATES AND COST RATES BY ALTERNATIVE, CALENDAR YEARS 1984-2070  
[As a percentage of taxable payroll]



## *Actuarial Analysis*

Two tests of the financial status of the OASI, DI, and combined OASDI programs are presented in this report. The test of long-range close actuarial balance incorporates a graduated tolerance scale which allows larger actuarial deficits for longer valuation periods, reflecting the greater uncertainty inherent in the estimates for later years. The other test, the short-range test of the financial adequacy of the program, was discussed earlier in this section.

Table II.F15 presents a comparison of the estimated actuarial balances with the minimum allowable balance (or maximum allowable deficit) under the long-range test, each expressed as a percentage of the summarized cost rate, based on the intermediate alternative II estimates. Values are shown for only 14 of the valuation periods: those of length 10 years, 15 years, and continuing in 5-year increments through 75 years. However, each of the 66 periods—those of length 10 years, 11 years, and continuing in 1-year increments through 75 years—is considered for the test. These minimum allowable balances are calculated to show the limit for each valuation period resulting from the graduated tolerance scale. The patterns in the estimated balances as a percentage of the summarized cost rates as well as that for the minimum allowable balance are presented graphically in figure II.F4, for the OASI, DI and combined OASDI programs. Values shown for the 25-year, 50-year, and 75-year valuation periods correspond to those presented in table II.F14.

As discussed earlier, a program is found not to be in long-range close actuarial balance if, for any of the valuation periods ending with the 10th through 75th years of the projection period, the estimated actuarial balance is less than the minimum allowable balance. The minimum allowable balance as a percentage of the summarized cost rate is  $-5.0$  percent for the full 75-year long-range period and is reduced uniformly for shorter valuation periods, reaching zero for the 10-year valuation period.

For the OASI program, the estimated actuarial balance as a percentage of the summarized cost rate exceeds the minimum allowable for valuation periods of length 10 years through 42 years, under the intermediate alternative II estimates. For valuation periods of length greater than 42 years, the estimated actuarial balance is less than the minimum allowable. For the full 75-year long-range period the estimated actuarial balance reaches  $-11.03$  percent of the summarized cost rate, for a shortfall of over 6 percent, from the minimum

allowable balance of -5.0 percent of the summarized cost rate. Thus, although the OASI program satisfies the short-range test of financial adequacy (as discussed earlier in this section), it is not in long-range close actuarial balance.

For the DI program, the estimated actuarial balance as a percentage of the summarized cost rate is less than the minimum allowable balance for each of the 66 separate valuation periods. The shortfall from the minimum allowable balance rises from 26.6 percent of the summarized cost rate for the 10-year valuation period to 27.6 percent of the summarized cost rate for the 36-year valuation period, thereafter declining to a level of 26.6 percent of the summarized cost rate for the full long-range period. Thus, the DI program is out of long-range close actuarial balance, in addition to the fact that it does not satisfy the short-range test of financial adequacy (as discussed earlier in this section).

For the combined OASDI program, the estimated actuarial balance as a percentage of the summarized cost rate exceeds the minimum allowable balance for valuation periods of length 10 years through 33 years. For valuation periods of length greater than 33 years, the estimated actuarial balance is below the minimum allowable balance. The size of the shortfall from the minimum allowable balance rises gradually reaching 8.8 percent of the summarized cost rate for the full 75-year long-range valuation period. Thus, although the OASDI program satisfies the short-range test of financial adequacy (as discussed earlier in this section), it is out of long-range close actuarial balance.

The OASI and DI programs, both separate and combined, were also found to be out of close actuarial balance in the 1993 Annual Report. However, estimated deficits for the combined OASDI program in this report are significantly greater than those shown in the 1993 report. The estimated deficits also begin earlier in this report. For both the OASI and DI programs, considered separately, the size of the estimated deficits, and therefore the degree to which the program is found to be out of close actuarial balance, is greater based on the estimates presented in this report.

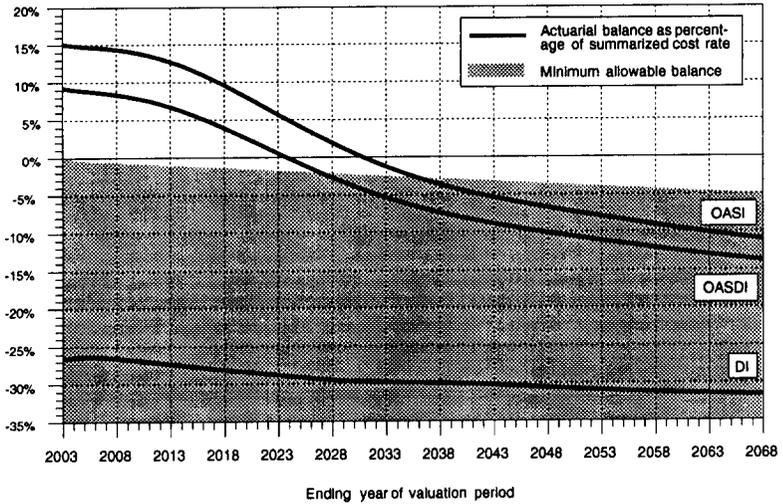
*Actuarial Analysis*

**TABLE II.F15.—COMPARISON OF ESTIMATED LONG-RANGE ACTUARIAL BALANCES WITH THE MINIMUM ALLOWABLE FOR THE TEST FOR CLOSE ACTUARIAL BALANCE BY TRUST FUND, BASED ON INTERMEDIATE ESTIMATES**

Valuation period	Rates (percentage of taxable payroll)		Balance as a percentage of cost rate		
	Summarized income rate	Summarized cost rate	Balance	Balance	Minimum allowable balance
<b>OASI:</b>					
10 years: 1994-2003 ...	12.80	11.12	1.68	15.11	0.00
15 years: 1994-2008 ...	12.31	10.76	1.55	14.36	-.38
20 years: 1994-2013 ...	12.08	10.71	1.37	12.76	-.77
25 years: 1994-2018 ...	11.96	10.91	1.05	9.59	-1.15
30 years: 1994-2023 ...	11.89	11.25	.64	5.67	-1.54
35 years: 1994-2028 ...	11.86	11.64	.22	1.90	-1.92
40 years: 1994-2033 ...	11.84	11.99	-.15	-1.28	-2.31
45 years: 1994-2038 ...	11.83	12.28	-.45	-3.67	-2.69
50 years: 1994-2043 ...	11.82	12.49	-.68	-5.41	-3.08
55 years: 1994-2048 ...	11.81	12.67	-.86	-6.76	-3.46
60 years: 1994-2053 ...	11.81	12.83	-1.02	-7.94	-3.85
65 years: 1994-2058 ...	11.81	12.99	-1.18	-9.06	-4.23
70 years: 1994-2063 ...	11.81	13.14	-1.33	-10.09	-4.62
75 years: 1994-2068 ...	11.81	13.28	-1.46	-11.03	-5.00
<b>DI:</b>					
10 years: 1994-2003 ...	1.33	1.81	-.48	-26.64	.00
15 years: 1994-2008 ...	1.36	1.86	-.49	-26.53	-.38
20 years: 1994-2013 ...	1.38	1.90	-.52	-27.34	-.77
25 years: 1994-2018 ...	1.40	1.94	-.55	-28.11	-1.15
30 years: 1994-2023 ...	1.40	1.97	-.57	-28.81	-1.54
35 years: 1994-2028 ...	1.41	2.00	-.59	-29.50	-1.92
40 years: 1994-2033 ...	1.41	2.01	-.60	-29.80	-2.31
45 years: 1994-2038 ...	1.42	2.02	-.61	-29.96	-2.69
50 years: 1994-2043 ...	1.42	2.04	-.61	-30.19	-3.08
55 years: 1994-2048 ...	1.42	2.05	-.63	-30.54	-3.46
60 years: 1994-2053 ...	1.43	2.06	-.64	-30.90	-3.85
65 years: 1994-2058 ...	1.43	2.08	-.65	-31.20	-4.23
70 years: 1994-2063 ...	1.43	2.08	-.65	-31.41	-4.62
75 years: 1994-2068 ...	1.43	2.09	-.66	-31.59	-5.00
<b>OASDI:</b>					
10 years: 1994-2003 ...	14.13	12.94	1.20	9.25	.00
15 years: 1994-2008 ...	13.67	12.62	1.05	8.36	-.38
20 years: 1994-2013 ...	13.46	12.61	.85	6.71	-.77
25 years: 1994-2018 ...	13.35	12.85	.50	3.90	-1.15
30 years: 1994-2023 ...	13.29	13.22	.07	.53	-1.54
35 years: 1994-2028 ...	13.27	13.64	-.37	-2.71	-1.92
40 years: 1994-2033 ...	13.25	14.01	-.75	-5.39	-2.31
45 years: 1994-2038 ...	13.24	14.30	-1.06	-7.40	-2.69
50 years: 1994-2043 ...	13.24	14.53	-1.29	-8.88	-3.08
55 years: 1994-2048 ...	13.24	14.72	-1.48	-10.07	-3.46
60 years: 1994-2053 ...	13.24	14.89	-1.66	-11.12	-3.85
65 years: 1994-2058 ...	13.24	15.06	-1.82	-12.11	-4.23
70 years: 1994-2063 ...	13.24	15.22	-1.98	-13.01	-4.62
75 years: 1994-2068 ...	13.24	15.37	-2.13	-13.83	-5.00

Note: Totals do not necessarily equal the sums of rounded components.

FIGURE II.F4.—COMPARISON OF ESTIMATED LONG-RANGE ACTUARIAL BALANCES WITH THE MINIMUM ALLOWABLE FOR CLOSE ACTUARIAL BALANCE, ALTERNATIVE II BY TRUST FUND



Annual income rates and their components are shown in table II.F16, for each alternative set of assumptions. The annual income rates reflect the scheduled payroll tax rates and the projected rates of income from the taxation of benefits, which reflect changes in the cost rates and the fact that benefit-taxation threshold amounts are not indexed.

Summarized values for the annual income and cost rates, along with their components, are presented in table II.F17 for 25-year, 50-year, and 75-year valuation periods. Summarized income rates include the starting trust fund balance in addition to the components included in the annual income rates. The summarized cost rates include the cost of reaching and maintaining an ending trust fund target of 100 percent of annual expenditures by the end of the period in addition to the expenditures included in the annual cost rates. Thus, the total summarized rates shown in table II.F17 are the same as the summarized income and cost rates shown in table II.F14 for the 25-year, 50-year, and 75-year valuation periods.

It may be noted that the payroll tax income expressed as a percentage of taxable payroll is slightly smaller than the actual tax rates in effect for each period. This results from the fact that all OASDI

## Actuarial Analysis

income and outgo amounts presented in this report are computed on a cash basis, i.e., amounts are attributed to the year in which they are actually received by, or expended from, the fund, while taxable payroll is allocated to the year in which earnings are paid. Because earnings are paid to workers before the corresponding payroll taxes are credited to the funds, payroll tax income for a particular year reflects a combination of the taxable payrolls from that year and from prior years, when payroll was smaller. Dividing payroll tax income by taxable payroll for a particular year, or period of years, will thus generally result in an income rate that is slightly less than the applicable tax rate for the period.

**TABLE II.F16.—COMPONENTS OF ANNUAL INCOME RATES BY TRUST FUND AND ALTERNATIVE, CALENDAR YEARS 1994-2070**

[As a percentage of taxable payroll]

Calendar year	OASI			DI			Combined		
	Payroll tax	Taxation of benefits	Total	Payroll tax	Taxation of benefits	Total	Payroll tax	Taxation of benefits	Total
Intermediate:									
1994	11.20	0.22	11.42	1.20	0.01	1.21	12.40	0.23	12.63
1995	11.20	.19	11.39	1.20	.01	1.21	12.40	.20	12.60
1996	11.20	.22	11.42	1.20	.01	1.21	12.40	.23	12.63
1997	11.20	.22	11.42	1.20	.01	1.21	12.40	.23	12.63
1998	11.20	.22	11.42	1.20	.01	1.21	12.40	.24	12.64
1999	11.20	.22	11.42	1.20	.01	1.21	12.40	.24	12.64
2000	10.98	.22	11.20	1.42	.01	1.43	12.40	.24	12.64
2001	10.98	.23	11.21	1.42	.01	1.43	12.40	.24	12.64
2002	10.98	.23	11.21	1.42	.02	1.44	12.40	.24	12.64
2003	10.98	.23	11.21	1.42	.02	1.44	12.40	.24	12.64
2005	10.98	.25	11.23	1.42	.02	1.44	12.40	.27	12.67
2010	10.98	.33	11.31	1.42	.02	1.44	12.40	.35	12.75
2015	10.98	.42	11.40	1.42	.03	1.45	12.40	.45	12.85
2020	10.98	.52	11.50	1.42	.03	1.45	12.40	.56	12.96
2025	10.98	.62	11.60	1.42	.03	1.45	12.40	.65	13.05
2030	10.98	.69	11.67	1.42	.04	1.46	12.40	.73	13.13
2035	10.98	.73	11.71	1.42	.04	1.46	12.40	.77	13.17
2040	10.98	.75	11.73	1.42	.04	1.46	12.40	.79	13.19
2045	10.98	.76	11.74	1.42	.04	1.46	12.40	.80	13.20
2050	10.98	.79	11.77	1.42	.04	1.46	12.40	.83	13.23
2055	10.98	.82	11.80	1.42	.04	1.46	12.40	.86	13.26
2060	10.98	.85	11.83	1.42	.04	1.46	12.40	.90	13.30
2065	10.98	.88	11.86	1.42	.04	1.46	12.40	.92	13.32
2070	10.98	.89	11.87	1.42	.04	1.46	12.40	.94	13.34

TABLE II.F16.—COMPONENTS OF ANNUAL INCOME RATES BY TRUST FUND AND ALTERNATIVE, CALENDAR YEARS 1994-2070 (Cont.)

Calendar year	[As a percentage of taxable payroll]								
	OASI			DI			Combined		
	Payroll tax	Taxation of benefits	Total	Payroll tax	Taxation of benefits	Total	Payroll tax	Taxation of benefits	Total
<b>Low Cost:</b>									
1994	11.20	0.21	11.41	1.20	0.01	1.21	12.40	0.22	12.62
1995	11.20	.17	11.37	1.20	.01	1.21	12.40	.18	12.58
1996	11.20	.21	11.41	1.20	.01	1.21	12.40	.22	12.62
1997	11.20	.21	11.41	1.20	.01	1.21	12.40	.22	12.62
1998	11.20	.21	11.41	1.20	.01	1.21	12.40	.22	12.62
1999	11.20	.21	11.41	1.20	.01	1.21	12.40	.22	12.62
2000	10.98	.21	11.19	1.42	.01	1.43	12.40	.22	12.62
2001	10.98	.20	11.18	1.42	.01	1.43	12.40	.22	12.62
2002	10.98	.20	11.18	1.42	.01	1.43	12.40	.22	12.62
2003	10.98	.20	11.18	1.42	.01	1.43	12.40	.22	12.62
2005	10.98	.22	11.20	1.42	.01	1.43	12.40	.24	12.64
2010	10.98	.28	11.26	1.42	.02	1.44	12.40	.30	12.70
2015	10.98	.36	11.34	1.42	.02	1.44	12.40	.38	12.78
2020	10.98	.43	11.41	1.42	.02	1.44	12.40	.45	12.85
2025	10.98	.50	11.48	1.42	.02	1.44	12.40	.52	12.92
2030	10.98	.55	11.53	1.42	.02	1.44	12.40	.57	12.97
2035	10.98	.57	11.55	1.42	.02	1.44	12.40	.59	12.99
2040	10.98	.57	11.55	1.42	.02	1.44	12.40	.59	12.99
2045	10.98	.56	11.54	1.42	.03	1.45	12.40	.59	12.99
2050	10.98	.57	11.55	1.42	.03	1.45	12.40	.59	12.99
2055	10.98	.58	11.56	1.42	.03	1.45	12.40	.60	13.00
2060	10.98	.58	11.56	1.42	.03	1.45	12.40	.61	13.01
2065	10.98	.59	11.57	1.42	.03	1.45	12.40	.61	13.01
2070	10.98	.59	11.57	1.42	.03	1.45	12.40	.62	13.02
<b>High Cost:</b>									
1994	11.20	.22	11.42	1.20	.01	1.21	12.40	.23	12.63
1995	11.20	.24	11.44	1.20	.01	1.21	12.40	.25	12.65
1996	11.20	.23	11.43	1.20	.01	1.21	12.40	.24	12.64
1997	11.20	.23	11.43	1.20	.01	1.21	12.40	.24	12.64
1998	11.20	.24	11.44	1.20	.02	1.22	12.40	.26	12.66
1999	11.20	.25	11.45	1.20	.02	1.22	12.40	.27	12.67
2000	10.98	.25	11.23	1.42	.02	1.44	12.40	.27	12.67
2001	10.98	.25	11.23	1.42	.02	1.44	12.40	.27	12.67
2002	10.98	.25	11.23	1.42	.02	1.44	12.40	.27	12.67
2003	10.98	.26	11.24	1.42	.02	1.44	12.40	.28	12.68
2005	10.98	.29	11.27	1.42	.02	1.44	12.40	.32	12.72
2010	10.98	.39	11.37	1.42	.03	1.45	12.40	.42	12.82
2015	10.98	.50	11.48	1.42	.04	1.46	12.40	.53	12.93
2020	10.98	.61	11.59	1.42	.04	1.46	12.40	.65	13.05
2025	10.98	.73	11.71	1.42	.05	1.47	12.40	.78	13.18
2030	10.98	.84	11.82	1.42	.05	1.47	12.40	.88	13.28
2035	10.98	.92	11.90	1.42	.05	1.47	12.40	.97	13.37
2040	10.98	.97	11.95	1.42	.05	1.47	12.40	1.02	13.42
2045	10.98	1.02	12.00	1.42	.06	1.48	12.40	1.07	13.47
2050	10.98	1.08	12.06	1.42	.06	1.48	12.40	1.14	13.54
2055	10.98	1.16	12.14	1.42	.06	1.48	12.40	1.22	13.62
2060	10.98	1.24	12.22	1.42	.06	1.48	12.40	1.30	13.70
2065	10.98	1.31	12.29	1.42	.06	1.48	12.40	1.37	13.77
2070	10.98	1.37	12.35	1.42	.06	1.48	12.40	1.43	13.83

Note: Totals do not necessarily equal the sums of rounded components.

Actuarial Analysis

**TABLE II.F17.—COMPONENTS OF SUMMARIZED INCOME RATES AND COST RATES BY TRUST FUND AND ALTERNATIVE, CALENDAR YEARS 1994-2068**

[As a percentage of taxable payroll]

Valuation period	Income rate				Cost rate		
	Payroll tax	Taxation of benefits	Beginning fund balance	Total	Disbursements	Ending fund target	Total
<b>OASI:</b>							
Intermediate:							
1994-2018.....	11.03	0.30	0.63	11.96	10.45	0.46	10.91
1994-2043.....	11.00	.46	.36	11.82	12.26	.23	12.49
1994-2068.....	11.00	.55	.27	11.81	13.14	.14	13.28
Low Cost:							
1994-2018.....	11.02	.26	.60	11.88	9.34	.39	9.73
1994-2043.....	11.00	.38	.34	11.71	10.41	.18	10.60
1994-2068.....	11.00	.43	.25	11.67	10.63	.10	10.73
High Cost:							
1994-2018.....	11.03	.34	.66	12.03	11.58	.52	12.10
1994-2043.....	11.00	.55	.37	11.92	14.14	.30	14.45
1994-2068.....	11.00	.69	.28	11.98	16.06	.20	16.27
<b>DI:</b>							
Intermediate:							
1994-2018.....	1.36	.02	.02	1.40	1.86	.08	1.94
1994-2043.....	1.39	.03	.01	1.42	2.00	.03	2.04
1994-2068.....	1.39	.03	.01	1.43	2.07	.02	2.09
Low Cost:							
1994-2018.....	1.36	.01	.01	1.39	1.46	.05	1.52
1994-2043.....	1.39	.02	.01	1.41	1.46	.02	1.48
1994-2068.....	1.40	.02	.01	1.42	1.45	.01	1.46
High Cost:							
1994-2018.....	1.36	.02	.02	1.40	2.29	.10	2.39
1994-2043.....	1.39	.03	.01	1.43	2.53	.05	2.58
1994-2068.....	1.39	.04	.01	1.44	2.70	.03	2.72
<b>OASDI:</b>							
Intermediate:							
1994-2018.....	12.39	.31	.65	13.35	12.32	.53	12.85
1994-2043.....	12.39	.48	.37	13.24	14.26	.27	14.53
1994-2068.....	12.39	.58	.28	13.24	15.21	.16	15.37
Low Cost:							
1994-2018.....	12.39	.27	.61	13.27	10.80	.44	11.25
1994-2043.....	12.39	.39	.34	13.13	11.87	.21	12.08
1994-2068.....	12.39	.45	.26	13.09	12.08	.12	12.19
High Cost:							
1994-2018.....	12.39	.36	.68	13.43	13.87	.62	14.49
1994-2043.....	12.39	.58	.38	13.35	16.68	.35	17.03
1994-2068.....	12.39	.74	.29	13.42	18.76	.23	18.99

Note: Totals do not necessarily equal the sums of rounded components.

The primary reason that the estimated OASDI cost rate increases rapidly after 2010 is that the number of beneficiaries is projected to increase more rapidly than the number of covered workers. This occurs because the relatively large number of persons born during the period of high fertility rates from the end of World War II through the mid-1960s will reach retirement age, and begin to receive benefits, while the relatively small number of persons born during the subsequent period of low fertility rates will comprise the labor force. A comparison of the numbers of covered workers and beneficiaries is shown in table II.F18.

**TABLE II.F18.—COMPARISON OF OASDI COVERED WORKERS AND BENEFICIARIES BY ALTERNATIVE, CALENDAR YEARS 1945-2070**

Calendar year	Covered workers <sup>1</sup> (in thousands)	Beneficiaries <sup>2</sup> (in thousands)			Covered workers per OASDI beneficiary	Beneficiaries per 100 covered workers
		OASI	DI	OASDI		
Historical data:						
1945	46,390	1,106	—	1,106	41.9	2
1950	48,280	2,930	—	2,930	16.5	6
1955	65,200	7,563	—	7,563	8.6	12
1960	72,530	13,740	522	14,262	5.1	20
1965	80,680	18,509	1,648	20,158	4.0	25
1970	93,090	22,618	2,568	25,186	3.7	27
1975	100,200	26,998	4,125	31,123	3.2	31
1980	112,212	30,385	4,734	35,119	3.2	31
1985	119,481	32,776	3,874	36,650	3.3	31
1986	121,962	33,349	3,972	37,321	3.3	31
1987	125,028	33,918	4,035	37,953	3.3	30
1988	129,121	34,343	4,077	38,420	3.4	30
1989	131,687	34,754	4,105	38,859	3.4	30
1990	132,548	35,266	4,204	39,470	3.4	30
1991	3131,774	35,795	4,388	40,173	3.3	30
1992	3132,467	36,314	4,716	41,030	3.2	31
1993	3135,209	36,758	5,083	41,841	3.2	31
Intermediate:						
1994	137,178	37,213	5,456	42,669	3.2	31
1995	139,068	37,654	5,830	43,484	3.2	31
2000	146,543	39,418	7,471	46,889	3.1	32
2005	152,642	41,379	8,844	50,223	3.0	33
2010	157,424	44,689	9,812	54,502	2.9	35
2015	159,944	50,489	10,214	60,703	2.6	38
2020	160,999	57,728	10,321	68,049	2.4	42
2025	161,726	64,574	10,570	75,144	2.2	46
2030	162,821	69,822	10,520	80,342	2.0	49
2035	164,443	72,991	10,398	83,389	2.0	51
2040	166,017	73,949	10,473	84,421	2.0	51
2045	167,063	74,595	10,885	85,480	2.0	51
2050	167,661	75,840	11,120	86,961	1.9	52
2055	168,087	77,956	11,274	89,230	1.9	53
2060	168,576	80,188	11,198	91,386	1.8	54
2065	169,091	81,917	11,187	93,104	1.8	55
2070	169,607	83,314	11,279	94,593	1.8	56

*Actuarial Analysis*

**TABLE II.F18.—COMPARISON OF OASDI COVERED WORKERS AND BENEFICIARIES BY ALTERNATIVE, CALENDAR YEARS 1945-2070 (Cont.)**

Calendar year	Covered workers <sup>1</sup> (in thousands)	Beneficiaries <sup>2</sup> (in thousands)			Covered workers per OASDI beneficiary	Beneficiaries per 100 covered workers
		OASI	DI	OASDI		
<b>Low Cost:</b>						
1994	137,876	37,208	5,412	42,620	3.2	31
1995	140,534	37,634	5,691	43,325	3.2	31
2000	150,723	39,185	6,738	45,923	3.3	30
2005	157,874	40,846	7,927	48,773	3.2	31
2010	163,256	43,889	8,354	52,243	3.1	32
2015	166,455	49,403	8,438	57,840	2.9	35
2020	169,066	56,281	8,373	64,654	2.6	38
2025	172,126	62,727	8,496	71,223	2.4	41
2030	176,087	67,420	8,439	75,859	2.3	43
2035	181,149	69,988	8,360	78,348	2.3	43
2040	186,640	70,422	8,455	78,877	2.4	42
2045	191,974	70,742	8,826	79,568	2.4	41
2050	197,330	71,759	9,096	80,855	2.4	41
2055	202,981	73,741	9,344	83,085	2.4	41
2060	209,046	75,927	9,477	85,403	2.4	41
2065	215,407	77,897	9,699	87,596	2.5	41
2070	221,769	79,912	10,003	89,916	2.5	41
<b>High Cost:</b>						
1994	136,914	37,220	5,498	42,718	3.2	31
1995	137,206	37,678	5,966	43,644	3.1	32
2000	141,941	39,652	8,420	48,072	3.0	34
2005	147,627	41,949	9,777	51,726	2.9	35
2010	151,773	45,514	11,301	56,816	2.7	37
2015	153,744	51,584	12,028	63,612	2.4	41
2020	153,428	59,204	12,309	71,514	2.1	47
2025	152,348	66,537	12,695	79,232	1.9	52
2030	151,163	72,549	12,667	85,215	1.8	56
2035	149,977	76,663	12,517	89,180	1.7	59
2040	148,374	78,587	12,582	91,169	1.6	61
2045	145,939	80,042	13,037	93,078	1.6	64
2050	142,850	82,010	13,211	95,221	1.5	67
2055	139,356	84,733	13,219	97,952	1.4	70
2060	135,790	87,452	12,839	100,292	1.4	74
2065	132,321	89,338	12,476	101,814	1.3	77
2070	128,887	90,467	12,254	102,720	1.3	80

<sup>1</sup>Workers who are paid at some time during the year for employment on which OASDI taxes are due.

<sup>2</sup>Beneficiaries with monthly benefits in current-payment status as of June 30.

<sup>3</sup>Preliminary.

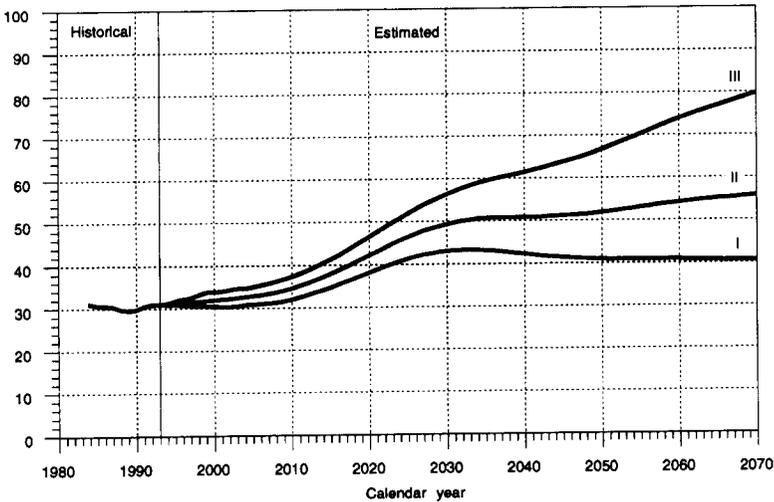
Note: The numbers of beneficiaries do not include certain uninsured persons, most of whom both attained age 72 before 1968 and have fewer than 3 quarters of coverage, in which cases the costs are reimbursed by the general fund of the Treasury. The number of such uninsured persons was 2,958 as of June 30, 1993, and is estimated to be fewer than 500 by the turn of the century. Totals do not necessarily equal the sums of rounded components.

Table II.F18 shows that the number of covered workers per beneficiary, which was about 3.2 in 1993, is estimated to decline in the future. Based on alternative I, for which high fertility rates and small reductions in death rates are assumed, the ratio declines to a level of 2.3 by 2030, and increases slowly thereafter. Based on alternative III, for which low fertility rates and substantial reductions in death rates are assumed, the decline is much greater, reaching 1.3 workers per beneficiary by 2065. Based on alternative II, the ratio declines

to 1.8 workers per beneficiary by 2060, and remains at that level through 2070.

The impact of the demographic shifts under the three alternatives on the OASDI cost rates is better understood by considering the projected number of beneficiaries per 100 workers. As compared to the 1993 level of 31 beneficiaries per 100 covered workers, this ratio is estimated to rise by the year 2070 to significantly higher levels, which are 41 under alternative I, 56 under alternative II, and 80 under alternative III. The significance of these numbers can be seen by comparing figure II.F3 to figure II.F5.

FIGURE II.F5.—RATIOS OF ESTIMATED OASDI BENEFICIARIES PER 100 COVERED WORKERS BY ALTERNATIVE, CALENDAR YEARS 1984-2070



For each alternative, the shape of the curve in figure II.F5, which shows beneficiaries per 100 covered workers, is strikingly similar to that of the corresponding cost-rate curve in figure II.F3, thereby emphasizing the extent to which the cost of the OASDI program is determined by the age patterns of the population. Because the cost rate is basically the product of the number of beneficiaries and their average benefit, divided by the product of the number of covered workers and their average taxable earnings (and because average benefits rise at about the same rate as average earnings), it is to be expected that the pattern of the annual cost rates is similar to that

## *Actuarial Analysis*

of the annual ratios of beneficiaries to workers. A graphical presentation of covered workers per beneficiary is shown in section I.G of the Overview.

Table II.F19 shows, by alternative, the estimated trust fund ratios (without regard to advance tax transfers that would be effected after the end of the 10-year, short-range period) for the separate and combined OASI and DI Trust Funds. Also shown in this table is the first year in which a fund is estimated to be exhausted, reflecting the effect of the provision for advance tax transfers. The patterns of the combined fund ratios, over the 75-year period, are shown graphically in figure II.F6, for all three sets of assumptions.

Based on alternative II, the DI trust fund ratio declines from 23 percent at the beginning of 1994 to 8 percent at the beginning of 1995, during which year the fund becomes depleted. The OASI trust fund ratio rises steadily from 129 percent for 1994, reaching a peak of 361 percent at the beginning of 2014. This increase in the OASI trust fund ratio results from the fact that the annual income rate (excluding interest) exceeds annual outgo for several years (see table II.F13). Thereafter, the OASI ratio declines steadily, with the OASI Trust Fund becoming exhausted in 2036.

The trust fund ratio for the hypothetical combined OASI and DI Trust Funds rises from 116 percent for 1994 to a peak of 241 percent at the beginning of 2012. Thereafter, the ratio declines, with the combined funds becoming exhausted in 2029.

The trust fund ratio for the combined OASDI program begins to decline in 2013, the same year in which annual expenditures begin to exceed noninterest income. Although the dollar amount of assets will continue to rise through 2018, because interest income more than offsets the shortfall in noninterest income, revenue from the general fund of the Treasury will be needed in increasingly large amounts, beginning in 2013, to redeem the trust funds' public-debt obligations due to the cash-flow shortfall. This will differ from the experience of recent years when the trust funds have been net lenders to the general fund. The change in the cash flow between the trust funds and the general fund is expected to have important public policy and economic implications that go well beyond the operation

of the OASDI program itself. Discussion of these issues is outside the scope of this report.

Based on alternative I, the trust fund ratio increases virtually throughout the long-range projection period for both the OASI and combined funds, reaching extremely high levels by 2070, of 1,014 and 882 percent, respectively. The DI trust fund ratio declines steadily reaching 11 percent at the beginning of 1995, including advance tax transfers, and becomes exhausted by the end of that year. In contrast, under alternative III, the OASI trust fund ratio is estimated to peak at 180 percent in 2007, thereafter declining to fund exhaustion by the end of 2023. The DI Trust Fund is estimated to decline rapidly, becoming depleted in 1995. The combined trust fund ratio is estimated to rise to a peak of 131 percent in 1998, declining thereafter to fund exhaustion by the end of 2014.

Thus, because of the high ultimate cost rates that are projected under all but the most optimistic assumptions, income will eventually need to be increased and/or program costs will need to be reduced in order to prevent the OASI Trust Fund from becoming exhausted. As already indicated, such action will be needed for the DI Trust Fund even under the more optimistic alternative I assumptions.

Even under the high cost assumptions, however, the combined OASI and DI funds on hand plus their estimated future income would be able to cover their combined expenditures for about 20 years into the future (until 2014). Under the alternative II assumptions the combined starting funds plus estimated future income would be able to cover expenditures for about 35 years into the future (until 2029). The program would be able to cover expenditures for the indefinite future under the more optimistic assumptions in alternative I. In the 1993 report, the combined trust funds were projected to be exhausted in 2017 under alternative III and in 2036 under alternative II.

Actuarial Analysis

**TABLE II.F19.—ESTIMATED TRUST FUND RATIOS BY TRUST FUND AND ALTERNATIVE, CALENDAR YEARS 1994-2070**

[In percent]

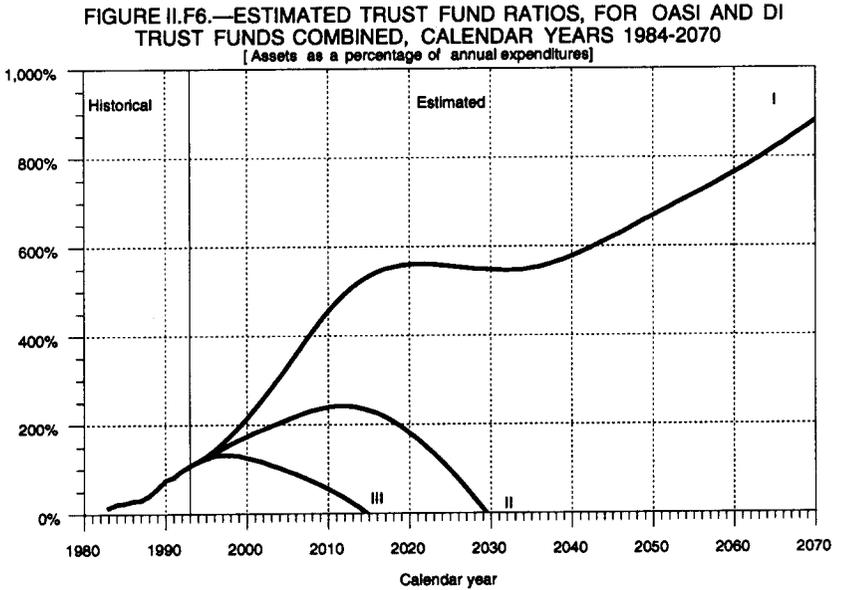
Calendar year	Intermediate			Low Cost			High Cost		
	OASI	DI	Com- bined	OASI	DI	Com- bined	OASI	DI	Com- bined
1994.....	129	23	116	129	23	117	129	22	116
1995.....	143	8	126	145	11	128	141	6	123
1996.....	157	(1)	136	163	(1)	142	151	(1)	129
1997.....	173	(1)	146	183	(1)	158	159	(1)	131
1998.....	188	(1)	156	205	(1)	175	165	(1)	131
1999.....	204	(1)	165	230	(1)	194	170	(1)	129
2000.....	219	(1)	173	256	(1)	214	173	(1)	124
2001.....	233	(1)	182	281	(1)	236	175	(1)	120
2002.....	246	(1)	189	309	(1)	259	176	(1)	115
2003.....	259	(1)	197	337	(1)	282	177	(1)	108
2005.....	286	(1)	211	397	(1)	331	179	(1)	95
2010.....	346	(1)	239	546	(1)	456	177	(1)	55
2015.....	359	(1)	231	634	(1)	534	144	(1)	(1)
2020.....	316	(1)	180	656	(1)	560	66	(1)	(1)
2025.....	238	(1)	96	649	(1)	556	(1)	(1)	(1)
2030.....	139	(1)	(1)	637	(1)	548	(1)	(1)	(1)
2035.....	28	(1)	(1)	639	(1)	551	(1)	(1)	(1)
2040.....	(1)	(1)	(1)	671	(1)	578	(1)	(1)	(1)
2045.....	(1)	(1)	(1)	723	(1)	621	(1)	(1)	(1)
2050.....	(1)	(1)	(1)	780	(1)	669	(1)	(1)	(1)
2055.....	(1)	(1)	(1)	832	(1)	716	(1)	(1)	(1)
2060.....	(1)	(1)	(1)	885	(1)	765	(1)	(1)	(1)
2065.....	(1)	(1)	(1)	946	(1)	821	(1)	(1)	(1)
2070.....	(1)	(1)	(1)	1,014	(1)	882	(1)	(1)	(1)
Trust fund is esti- mated to be ex- hausted in.....	2036	1995	2029	(2)	1995	(2)	2023	1995	2014

<sup>1</sup>The trust fund is estimated to have been exhausted by the beginning of this year. The last line of the table shows the specific year of trust fund exhaustion.

<sup>2</sup>The fund is not estimated to be exhausted within the projection period.

Note: See Glossary for definition of trust fund ratio. The OASDI ratios shown for years after a given fund is estimated to be exhausted are theoretical and are shown for informational purposes only.

A graphic illustration of the trust fund ratios for the combined trust funds is shown in figure II.F6 for each of the alternative sets of assumptions.



## Actuarial Analysis

Reasons for changes from last year's report to this report in the long-range actuarial balance under the intermediate assumptions are itemized in table II.F20. Also shown are the estimated effects associated with each reason for change.

**TABLE II.F20.—CHANGE IN ACTUARIAL BALANCE  
ESTIMATED ON THE BASIS OF INTERMEDIATE ESTIMATES  
BY TRUST FUND AND REASON FOR CHANGE**

[As a percentage of taxable payroll]			
Item	OASI	DI	Combined
Shown in last year's report:			
Income rate .....	11.77	1.43	13.21
Cost rate .....	12.74	1.93	14.67
Actuarial balance .....	-97	-49	-1.46
Changes in actuarial balance due to changes in:			
Valuation period .....	-05	-00	-05
Demographic assumptions .....	+00	-00	-00
Economic assumptions .....	-17	-02	-18
Disability assumptions .....	-00	-11	-11
Methods .....	-27	-04	-31
Total change in actuarial balance .....	-49	-17	-66
Shown in this report:			
Actuarial balance .....	-1.46	-.66	-2.13
Income rate .....	11.81	1.43	13.24
Cost rate .....	13.28	2.09	15.37

Note: Totals do not necessarily equal the sums of rounded components.

In changing from the valuation period of last year's report, which was 1993-2067, to the valuation period of this report, 1994-2068, the relatively large negative annual balance for the year 2068 is included. This results in a decrease in the long-range actuarial balance. (Note that the positive balance for 1993 is, in effect, retained because the funds accumulated during the year are included in the income rate and the actuarial balance for this year's report.)

Several demographic assumptions were modified: (1) the starting population was updated to reflect intercensal estimates by the Bureau of the Census, which showed more people at high ages than did earlier estimates; (2) the total fertility rate was decreased slightly for the first 15 projection years reflecting recently observed birth rates in 1992 that were lower than expected; (3) projected mortality rates for males were lowered, reflecting the latest data, which were lower than expected for 1992 and 1993; and (4) net legal immigration was lowered slightly for years through 2000 reflecting the actual level of legal immigration for 1992, which was lower than expected. Each of these modifications results in a decrease in the long-range actuarial balance, the largest of which is due to the updated mortality

rates. In addition, the method for projecting retired worker beneficiaries was modified to better reflect the increasing proportion of other-than-legal aliens in the population. It is presumed that other-than-legal aliens are less likely to receive benefits than are people residing in the United States legally. This change results in a significant increase in the OASDI actuarial balance. The combined effect of these changes on the long-range actuarial balance is insignificant.

Ultimate economic assumptions for interest rates and growth rates in price levels were not changed for this report. However, three changes in economic assumptions did have significant effects on the long-range actuarial balance. First, the ultimate real-wage differential was reduced from 1.1 to 1.0 percent for the intermediate set of assumptions based on a careful reassessment of past data and expectations for the future. Second, projected labor force participation rates were lowered somewhat, reflecting increases in the expected numbers of people who will be receiving disabled worker benefits in the future. Third, data for 1993 indicated a larger than expected drop in the proportion of covered wages that was taxable. This effect, presumably based on higher increases in wages for high paid workers than for low and average wage earners, results in a slightly lower level of taxable payroll throughout the long-range projection period. Other economic assumptions and projected rates of employment were updated to incorporate the latest information and analyses. The net effect of these changes is a decrease in the long-range actuarial balance.

Projections of the number of disabled beneficiaries were increased reflecting recent increases in incidence rates and decreases in termination rates. Overall ultimate disability incidence rates were increased, with increases presumed to be disproportionately at younger ages, consistent with recent experience. The overall rate of termination of disability was reduced, consistent with the relatively larger increase in young disability cases who tend to continue to receive disabled worker benefits longer. These modifications result in a reduction in the long-range actuarial balance for the DI program.

Several significant improvements and updates were made in the methods used to project the cost and income of the OASDI program. Updated sample data for benefits awarded in 1992 were used as the starting point for projecting the level of average benefits for future beneficiaries. The increase in average benefit levels from the previous

## *Actuarial Analysis*

sample, for 1988 awards, to the new sample was higher than had been previously projected. Almost 75 percent of the increase in the long-range cost due to changes in methodology results from two factors relating to the updated sample, with each factor having about the same effect on cost. These factors are:

1. New beneficiaries in the 1992 sample had earnings in a higher proportion of their working-age years than had been projected from the earlier sample. Although the difference was small, the higher proportion of years worked has a significant effect when used in projections for all workers in the future.
2. For each new beneficiary, benefits are computed on the basis of an average level of their earnings for a specified number of years. Their highest years of earnings are selected for this average from among all years elapsed after 1950. Two elements affecting this average level of earnings for benefit calculations changed from the 1988 sample to the 1992 sample. First, for new beneficiaries in the 1992 sample, 4 additional years after 1950 were available for selecting the highest years of earnings. For many workers, earnings from one or more of these additional years would be higher than, and would thus replace, some years previously selected from years available for the 1988 sample. This, by itself, has the effect of increasing average earnings and, thus, average benefit levels. Second, however, the specified number of years of highest earnings used for computing benefits was higher, by 3 or 4 years, for new beneficiaries in the 1992 sample. Since each additional year of earnings selected for the average must be lower than all previously selected years, this by itself, has the effect of decreasing average earnings and, thus, average benefit levels. While previous projections of average benefit levels for 1992 awards, based on the earlier sample data, had taken both of these elements into account, the actual combined net effect, as measured from the updated sample, was a higher level of average benefits, than had been estimated for 1992 awards, based on the earlier sample.

These and other, smaller effects from updating the sample data of new beneficiaries combined to significantly increase the level of projected benefits and thus significantly decrease the OASDI actuarial balance. In addition, the projected revenue received based on the taxation of OASDI benefits was reduced slightly, reflecting updated

data and estimates received from the Office of Tax Analysis at the Department of the Treasury, and improvements in the long-range method for projecting the level of revenue. The effect of this change was a small decrease in the estimated actuarial balance.

The cost of the OASDI program has been discussed in this section in relation to taxable payroll, which is a program-related concept that is very useful in analyzing the financial status of the OASDI program. The cost can also be discussed in relation to broader economic concepts, such as the gross domestic product (GDP). OASDI outlays generally rise from a little less than 5 percent of GDP currently to about 6.8 percent of GDP by the end of the 75-year projection period under alternative II. Discussion of both the cost and the taxable payroll of the OASDI program in relation to GDP is presented in section III.C.